

## EE626 – OPTOELECTRONICS

**Instructor:** Prof. H. Grebel, Rm302, MIC; x3538 grebel@njit.edu; Office hours: M: 1500-1800

**Course Description:** The course addresses electronic and optical devices on the micron and nano-scales. High-speed optoelectronic modulators (optical devices controlled by electronics and electronic devices controlled by optics) are at the core of optical communication, displays and radar systems. The course will cover topics such as semiconductors, dielectrics in addition to carbon nanotubes and graphene), structures (optical waveguides and electronic channels), detection methods sources (lasers and LEDs) and manipulation of light and electrons

**Text:** A. Yariv, "Optical Electronics in Modern Communication", 5<sup>th</sup> edition, Oxford University Press, NY, 1997.

**Grading Policy:** MT: 40%; Final: 40%; Research paper: 15%; HW: 5%

**Honor code:** The NJIT honor code will be upheld and that any violations will be brought to the immediate attention of the Dean of Students.

### Course Outline

Week	Topic	Chapter/Sections	Chapter/Problems
1	EM Theory	1:1-3	1:1,2,6
2	Birefringence	1:4-5	1:7,8,14
3	Rays and Beams	2:1-4	2:2,4,5
4	Gaussian Beams	2:5-9	2:8,9,11,12
5	Optical Waveguides	13:1-2	13:7
6	Coupled Mode Theory	13:3-6	13:8,9

### MIDTERM

7	Electro-Optics	9:1-4	9:1,2,4
9	EO Devices	9:5-9	9:5,6,8,9
10	Acousto-Optics	12:1,3	12:2,3,4,5
11	AO Devices	12:4	12:6,7
12	Optical Processing	14	
13	Photorefraction	18	
14	Displays	Handout	

### FINAL

**Course Learning Outcomes:**

Students should be able to understand and comprehend the followings:

1. Concepts of basic solids states (e.g., semiconductors)
2. Concepts of wave-propagation
3. Concepts of electro-optics elements
4. Concepts of emission and absorption

**Relevant Student Outcomes:**

- (a) Ability to identify, formulate and solve engineering problems related to electrooptics (CLO 1, 2, 3)
- (b) Ability to analyze and solve problems at hand (CLO 1, 2, 3)
- (c) Ability to communicate effectively (CLO 4)
- (d) Ability to understand the underlined constraints upon design of systems, components, or processes related to optoelectronics, such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (CLO 1, 2, 3)
- (e) Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice; (CLO 1, 2, 3)